REMARKS

Claims 1-12 are all the claims pending in the application.

Claim 1 was rejected under 35 U.S.C. §103(a) as being unpatentable over Lin et al (US 6,958,494 B2; "Lin") in view of Sakamoto et al (US 2004/0124422 Al; "Sakamoto").

Claims 2-12 are rejected under 35 U.S.C. §103(a) as being unpatentable over Lin et al (US 6,958,494 B2), Sakamoto et al (US 2004/0124422 Al) and further in view of Uemura et al (US 2002/0072204 Al).

Fig. 8 of Lin was cited as disclosing a transparent positive electrode 317 (Fig. 8, column 5, line 37) for gallium nitride-based compound semiconductor light-emitting devices (abstract, lines 1-3), comprising a contact metal layer 316 (Fig. 8, column 5, lines 35-37) in contact with a p-type semiconductor layer 315 (Fig. 8, column 5, line 30), a bonding pad layer 321 (Fig. 8, column 5, line 43).

The Examiner acknowledged that Lin does <u>not</u> disclose a current diffusing layer in Fig. 8 and the relevant disclosure of Fig. 8. The Examiner also acknowledged Lin does <u>not</u> disclose the claimed structure order of the contact metal layer, the current diffusing layer, and the bonding pad layer on the current diffusing layer, as recited in claim 1.

The Examiner cited Fig. 4, col. 4, lines 29-67 of Lin as disclosing a current diffusing layer 216 (Fig. 4, col. 4, lines 41-42) and a bonding pad layer 221 (Fig 4, col. 5, line 6) on a current diffusing layer 216 (Fig. 4, col. 4, lines 41-42), and that a contact metal layer 217 (Fig. 4, col. 3, lines 60-61) is on a current diffusing layer 216 (Fig. 4, col. 4, lines 41-42) in the embodiment as shown in Fig. 4.

The reason for rejection was that it would have been obvious to add a current diffusing layer on the contact metal layer to the embodiment of Fig. 8 of Lin in view of the structure of

Fig. 4, to arrive the claimed transparent positive electrode for gallium nitride-based compound. In this regard, the Examiner takes the position that "the rearrangement of parts was held to have been obvious for a person having ordinary skill in the art."

Applicants respectfully disagree, and respectfully request the Examiner to reconsider for the following reasons.

Claim 1 is directed to a transparent positive electrode for gallium nitride-based compound semiconductor light-emitting devices, comprising a contact metal layer in contact with a p-type semiconductor layer, a current diffusing layer on the contact metal layer, the current diffusing layer having an electrical conductivity larger than that of the contact metal layer, and a bonding pad layer on the current diffusing layer.

Turning to the cited prior art, Lin is directed to a light emitting diode including a current spreading layer. Lin discloses a conductive and transparent indium tin oxide (ITO) thin film with an ultra-thin composite metallic layer serving as an ohmic contact and a current spreading layer. See Abstract. Lin discloses in Fig. 4 an AlGaInP-based light emitting diode, and Lin discloses in Fig. 8 a GaN-based light emitting diode. Col. 3, lines 9-11 and lines 23-25.

Lin discloses in Fig. 4 and Fig. 8 two separate and independent embodiments for two different types of light emitting diodes. There is no teaching or suggestion within Lin for modifying and combining the disparate embodiments disclosed in Figs. 4 and 8 in the manner suggested by the Examiner, or otherwise.

Instead, Lin specifically teaches that AlGaInP-based light emitting diode and GaN-based light emitting diode should adopt different layer structures. Lin discloses that for AlGaInP materials, a thick GaP current spreading layer is omitted; and for GaN-based LEDs, the semi-transparent Ni/Au contact layer is avoided. See Abstract.

Further, there is disclosure or suggestion within the cited prior art which would lead one of ordinary skill to modify the AlGaInP-based light emitting diode of Lin in the manner suggested by the Examiner. Moreover, the rearrangement of parts as suggested by the Examiner would modify operation of the device, and for this additional reason the present claims are unobvious.

Lin discloses, as shown in Fig. 4, a positive electrode in which a contact metal layer 217 is formed on a current diffusing layer 216. Therefore, the position relationship between the contact metal layer and the current diffusing layer of Lin is different from that in the present invention.

Further, the current diffusing layer 216 in Fig. 4 of Lin is composed of a semiconductor layer (see col. 4, lines 43 to 45 of Lin). Therefore, the electrical conductivity of the current diffusing layer is smaller than that of the contact metal layer.

On the other hand, as required by present claim 1, the electrical conductivity of the current diffusing layer is larger than that of the contact metal layer.

Also, Lin discloses an ITO layer 317, as shown in Fig. 8, which serves as a current diffusing layer (see col. 3, lines 42 to 47 of Lin). However, the specific resistance of ITO is 10^{-4} to 10^{-3} Ω x cm. The specific resistances of Au and Ti used as the composite metallic layer 316 are $2x10^{-8}$ and $4x10^{-7}$ Ω x cm, respectively. Since the electrical conductivity is inversely proportional to the specific resistance, the electrical conductivity of the ITO layer 317 is immeasurably smaller than that of the composite metallic layer 316.

To the contrary, the electrical conductivity of the current diffusing layer is larger than that of the contact metal layer, as recited in claim 1.

Sakamoto was cited to make up the noted deficiency of Lin. The Examiner relied on Sakamoto as disclosing that the current diffusing layer has an electrical conductivity larger than that of the contact metal layer (Sakamoto, Para. 94, lines 21-26). Specifically, Sakamoto was cited as teaching the use of a current diffusing layer and a contact metal layer of differing conductivities for improving light emission uniformly without the need for too high a concentration current and for improving light emission efficiency (Para. 26). The reason for rejection was that it would have been obvious to replace Lin's structure material with Sakamoto's structure material including a current diffusing layer and contact metal layer of differing conductivities for achieving the above-noted advantages (Para. 26).

Applicants respectfully disagree with the Examiner's interpretation of Sakamoto. The cited passage of Sakamoto simply discloses that:

> [0026] According to a light-emitting diode of the present invention, it is possible to make its light emission more uniform without too high a concentration current and to improve efficiency of light outgoing and its life.
>
> [0094] ...A current diffusing member 20a of the p-side electrode (hereinafter occasionally refer to a "p-side current diffusing member") is formed on virtually the whole of p-type contact layer. The current diffusing member is composed of Ni and Au, which are successively laminated from the p-type contact layer (or can be alloy of Ni and Au). The p-side pad electrode 20b is composed of W, Pt, and Au, which are successively laminated as similar to the n-side electrode. As mentioned above, since the n-side electrode 19 and the p-side pad electrode 20b are formed in the same construction, the n-side electrode 19 and the p-side pad electrode 20b can be formed in one forming process. In addition, in this embodiment, in order to reserve an emitting area (first area), the p-side current diffusing member 20a partially surrounds the n-side electrode 19."

This is <u>not</u> a disclosure of a current diffusing layer having an electrical conductivity larger than that of the contact metal layer, as recited in claim 1.

In the electrode structure disclosed in Sakamoto, the current diffusing layer 20a is directly formed on the Mg-doped GaN layer 8. The Examiner appears to consider the Mg-doped GaN layer 8 as corresponding to the contact metal layer in the present invention. However, the Mg-doped GaN layer 8 of Sakamoto is not a contact metal layer, but a p-type semiconductor layer. Therefore, Sakamoto does not make up the noted deficiency of Lin.

Uemura was cited as disclosing the limitations of claims 2-15 with respect to the material of the contact metal layer and the current diffusing layer, and the thickness ranges of the contact metal layer and the current diffusing layer. However, Uemura does not make up the above noted deficiencies of Lin and Sakamoto.

In addition, the instant specification discloses, for example, at page 7, paragraph, that "in order to compensate for the current diffusibility of the contact metal layer, a current diffusing layer comprising a metal thin film having a high light transmittance and being more electrically conductive than the contact metal layer is disposed, whereby the current can be uniformly diffused without greatly impairing the low contact resistance property and light transmittance of the platinum group metal and in turn, a light-emitting device having a high light emission output can be obtained". This characteristic feature in the invention is not disclosed by Lin or any cited reference.

In view of the above, it is respectfully submitted that the claims 1-12 are patentable over Lin in view of Sakamoto and Uemura, and withdrawal of the foregoing rejections under 35 U.S.C. §103(a) is respectfully requested.

Reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be

best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

Yan Lan
Registration No. 50,214

SUGHRUE MION, PLLC
Telephone: (202) 293-7060
Facsimile: (202) 293-7860
WASHINGTON OFFICE
23373
CUSTOMER NUMBER

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